INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2005	**Park:** Shenandoah NP
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No co-investigators

Permit#:
SHEN-2005-SCI-0002

Park-assigned Study Id. #:
SHEN-00309

Project Title:
The Effects of Human Activities and Recreational Use on the Bacteria Concentrations in the Streams of Shenandoah National Park, Virginia

Permit Start Date: Apr 01, 2005	**Permit Expiration Date** Sep 30, 2007
Study Start Date: Oct 01, 2004	**Study End Date** Sep 30, 2007

Study Status:
Continuing

Activity Type:
Monitoring

Subject/Discipline:
Water Quality

Objectives:

Fecal contamination of streams has resulted in elevated bacteria concentrations and has become a problem of national scope. Because of these elevated bacteria concentrations, State Regulatory Agencies have classified many surface waters as impaired with respect to bacterial water-quality standards. Elevated bacteria concentrations have been linked to human-influenced contributions like agriculture and urbanization (Hagedorn and others, 1999; Wiggins, 1996), as well as nonhuman-influenced contributions, such as wildlife (Simmons and others, 1995). Despite the widespread evaluation and characterization of bacteria concentrations in many impaired stream environments, minimal research has been directed towards recreational forested systems, like those found in national parks.

With approximately 1.8 million visitors each year (Shane Spitzer, Shenandoah National Park, written Communication, 2003), Shenandoah National Park is subject to extensive recreational use (including camping, hiking, swimming, and fishing). The effects of these park visitors and their associated recreational activities on the bacterial water quality of the streams in the park are largely unknown and a real concern for park managers. In one of the few published studies that have evaluated the bacterial water-quality impact of human activities in national parks, Farag and others (2001) documented the occurrence of human fecal contamination â presumably caused by hikers and campers. Their work suggests that recreational use by visitors may adversely impact stream-water quality. Additional studies are needed to further understand these possible impacts. Because of its large number of recreational visitors each year, there is concern that some streams in Shenandoah National Park may have elevated bacterial levels. If elevated bacteria levels occur, they may pose a health risk to park visitors who come into contact with the streams.

The primary objective of this study is to measure bacteria concentrations in 14 streams in the park and determine the potential for human activities and recreational uses to adversely affect these concentrations. These data will also provide the park staff with an important initial database for managing water quality and assessing possible risks to human health.

Findings and Status:

The objective of this study is to measure bacteria concentrations in at least 14 streams in Shenandoah National Park and determine the potential for human activities and recreational uses to adversely affect these concentrations. During FY05, a total of 10 streams in the park were sampled for bacterial concentrations during low-flow conditions. Sampling was performed primarily during the summer months because recreational use and bacterial survivorship are greatest during warm months. All FY05 project objectives were achieved in FY05. In addition to sampling these streams during low-flow conditions, 2 stream samples were also collected from most of the 10 streams under storm-flow conditions. Bacterial concentrations

were observed to be relatively low during base-flow periods and were observed to increase during storm-flow conditions. In addition to the storm-flow sampling, several water-supply springs in the park were also sampled for bacteria concentrations; for these springs, water samples were collected by Park Service staff and the samples were analyzed by USGS staff. Most springs had relatively low bacterial concentrations, although several were slightly elevated when compared to other sampled springs. During FY06, a different collection of approximately 10 streams will be sampled for bacterial concentrations under both low-flow and storm-flow conditions; additional spring samples will also be collected and analyzed. These bacteria data will provide the park staff with an important database for managing water quality in the park and assessing possible risks to human health.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
0	50000

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
n/a	0